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REMOTELY PILOTED AIRCRAFT:  
AN INTEGRATED DOMESTIC DISASTER RELIEF PLAN

by

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## PREFACE

I chose this topic due to being in the remotely piloted aircraft (RPA) community only a short time before I learned of the well-intentioned, but ill-fated, attempt to help in the aftermath of Hurricane Katrina. Being personally affected through family members who lost everything but their lives in the devastating hurricane of 2005, it is unfathomable to me that the US had the diverse resource of RPAs ready, willing, and on-scene to help, yet not be permitted to fly. Six years later, a new *National Response Framework* from the Federal Emergency Management Agency (FEMA), and long-term projects to integrate RPAs into the Federal Aviation Administration (FAA) airspace, we are only slightly closer to a formal solution allowing RPAs to help if there is a disaster tomorrow. It is my sincere hope that the results of this research will be outdated and unnecessary within the next decade due to a permanent system in America allowing RPAs unimpeded flight. However, in the meantime, it is of the utmost critical timeliness that a course of action be created, agreed upon by all parties involved, and integrated into a national disaster preparedness plan. In the unfortunate event this plan is invoked, the homes, properties, businesses, national treasures, and, most importantly, lives that potentially can be saved are countless.

I would like to acknowledge Dr. Stephen Schwalbe and Dr. Richard Smith, who both provided direct feedback, academic expertise, and the guidance that only comes from a wealth of experience. Col David Krumm, 49th Wing Commander, exemplified the kind of leadership of legends while providing mentorship and thoughtful insights. My husband, a fellow RPA pilot, provided moral support and also let me know when my ideas needed a reality check. My mother is the “village” that helped raise our son while I diligently studied. Our son is not only the inspiration of this research, but also the inspiration for our family.

## **ABSTRACT**

How should government agencies integrate remotely piloted aircraft (RPAs) into emergency response plans in support of relief efforts following a major disaster? Highlighting two recent historical events, Hurricane Katrina and the Haiti earthquake, as cases for motivation and lessons learned, research will determine the feasibility of integration, identify the roadblocks, and suggest a way forward for agencies to move for RPAs to effectively participate in emergency response. The Department of Defense (DoD) should coordinate with the Federal Aviation Administration (FAA) and Federal Emergency Management Agency (FEMA) to integrate its RPAs into incident management plans in support of domestic disaster relief efforts.

Some DoD agencies have developed concepts of operations and employment for Defense Support of Civil Authorities. Based on a Presidential Directive in mid-2011, FEMA is reassessing its disaster response system by rewriting its doctrine and developing a full-spectrum preparedness program. With Congress' approval of the FAA Modernization and Reform Act of 2012, the FAA is not only funded, but also energized to substantially improve its efforts to integrate RPAs into the National Airspace System (NAS).

All these efforts present a critical window of opportunity where agencies should capitalize to integrate RPAs into the NAS, even if only temporarily. First, FEMA should integrate RPA support into its incident management systems, be familiar with their contributions, and be able to interoperate with them during a major disaster response. Furthermore, the FAA should establish RPA de-confliction procedures for immediate and temporary use in a disaster-stricken area. Finally, DoD crews should be trained and capable of successfully completing the mission of supporting civil agencies in any domestic disaster response. These activities combine to ensure the most capable assets are employed to effectively react to national emergencies.

## SECTION 1: Introduction

How should the military, government, and civilian agencies integrate remotely piloted aircraft (RPAs) into emergency response plans in support of relief efforts following a major disaster?

Currently, RPAs cannot participate in domestic catastrophic events due to restrictive Federal Aviation Administration (FAA) regulations, such as having a chase plane or undergoing lengthy waiver processes. The DoD's most current UAS (Unmanned Aircraft Systems) Roadmap acknowledges that "Current access for UAS is greatly limited primarily due to FAA regulatory compliance issues that govern UAS operations in the NAS [National Airspace System]."<sup>1</sup> Although tests have been accomplished recently to validate the FAA's current guidance on UAS flight in the NAS, the efforts to integrate Department of Defense (DoD) RPAs into emergency response plans are extremely limited. A two-year study on UAS in the NAS, commissioned in 2010 between the FAA and Insitu, a subsidiary of Boeing, will likely not field results for many years.<sup>2</sup> The FAA considers the integration discussion a long-term activity, with the milestone of integrating civil unmanned aircraft systems into the NAS targeted for no later than September 2015.<sup>3</sup> In 2011, Deputy Secretary of Defense William Lynn advised that "Near-term efforts can help increase UAS access to the NAS immediately, while a full set of regulations, policy and procedures, standards, and technology must be developed and considered to allow UAS appropriate access to the NAS in a safe and efficient manner."<sup>4</sup> The Federal Emergency Management Administration (FEMA) has not yet included RPAs as a viable resource in its *National Response Framework (NRF)*, the governing guidance for national response to a disaster.<sup>5</sup> However, much like the airspace over Afghanistan, where the military is able to safely control manned and unmanned assets, the FAA and FEMA could control and coordinate RPAs in

the airspace surrounding disaster relief efforts. The *National Strategy for Homeland Security* promises that, “We will bring to bear the Nation’s full capabilities and resources to save lives, mitigate suffering, and protect property.”<sup>6</sup> Thus, there may be an inconsistency between the established doctrine and effective planning for emergency situations, resulting in the most modern and capable resources being underutilized.

Ultimately, the affected agencies should coordinate, approve, and implement a plan for DoD RPAs to participate in FAA airspace in support of FEMA’s incident management plans because the platforms are an invaluable asset during recovery efforts after a national disaster.

A modified case study will frame the methodology, specifically using an explanatory research model to answer the “why” and “how” questions of this problem. Highlighting two historical events, Hurricane Katrina and the Haiti earthquake, as cases for motivation and lessons-learned, the research will determine feasibility of integration, identify roadblocks, and suggest a way forward for the government to integrate RPAs to effectively participate in domestic disaster relief efforts. An in-depth analysis of current RPA limitations, FAA regulations, and FEMA response plans will identify the roadblocks. This research does not claim to support the premise that RPAs are the sole or primary aircraft responsible for relief missions, but rather indicates how to integrate RPAs into an already robust air response, to include such assets as helicopters, cargo transporters, and medical airlift. However, the niche filled by RPAs in emergency response, the dedicated and persistent incident awareness and assessment is one currently unfilled by other platforms. This research should be valuable to the global RPA community (both military and civilian alike), as well as participants at all levels of the FAA and the Department of Homeland Security (DHS), including FEMA.



## SECTION 2: Background

In 2010, an RPA executive committee comprised of affected agencies responded to Congress' discovery of the slow progress on national airspace integration. The committee directly acknowledged the requirements of each agency's participation and need for cooperation in its *NAS Access Plan*:

It is the intent of Congress, by the Robert T. Stafford Disaster Relief and Emergency Assistance Act, to provide an orderly and continuing means of assistance by the Federal Government to State and local governments in carrying out their responsibilities to alleviate the suffering and damage, resulting from an emergency or disaster. Further, it is the purpose of Homeland Security Presidential Directive 5 to enhance the ability of the United States to manage domestic incidents by establishing a single, comprehensive national incident management system. This management system is designed to cover the prevention, preparation, response, and recovery from terrorist attacks, major disasters, and other emergencies.<sup>7</sup>

With the proliferation of RPAs, there will soon be many platforms, both military and civilian, flying in the skies over America, as evidenced in Figure 1.

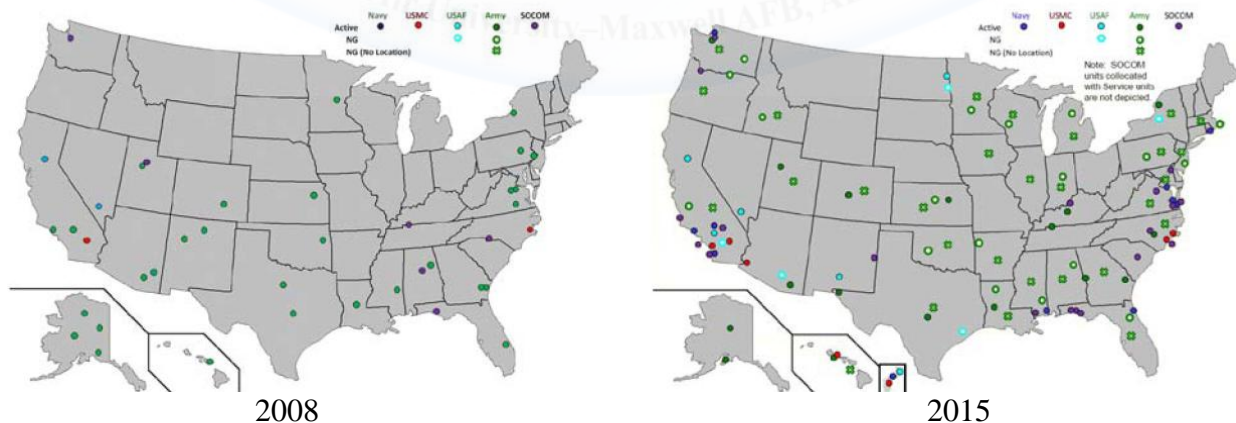


Figure 1. Expected Increase in DoD RPA Locations from 2008 to 2015<sup>8</sup>

DoD's current RPA roadmap acknowledges that "While the force structure continues to grow, the ability to integrate UAS into the NAS has not kept pace."<sup>9</sup> Although the systems have been

an existing resource for decades and are programmed to be essential to future air exploitation, the RPA community does not have overwhelming support from the masses. For example, a February 2012 article in *The Washington Times* led with “Look! Up in the sky! Is it a bird? Is it a plane? It’s ... a drone, and it’s watching you. That’s what privacy advocates fear from a bill Congress passed this week to make it easier for the government to fly unmanned spy planes in U.S. airspace.”<sup>10</sup> From the news media’s negatively connoted use of the term “drone,” to the fear of personal privacy infringement, combined with the lack of positive publicity, the RPA platform and associated community have not earned a warm reception from the general American population.

Currently, unmanned aircraft are not permitted to fly outside certain restricted areas in the US, most of which are reserved for military use. However, the capabilities of these systems are undeniable: unarmed intelligence, surveillance, and reconnaissance, incident assessment, and search and rescue, with loiter times over 24 hours and the ability to provide real-time data to supported units with low overall risk. The applications of such capabilities are endless: border patrol, counterterrorism, counterdrug operations, and disaster relief efforts. As depicted in Figure 2 below, an RPA’s contributions in disaster response increase the situational awareness of decision makers.

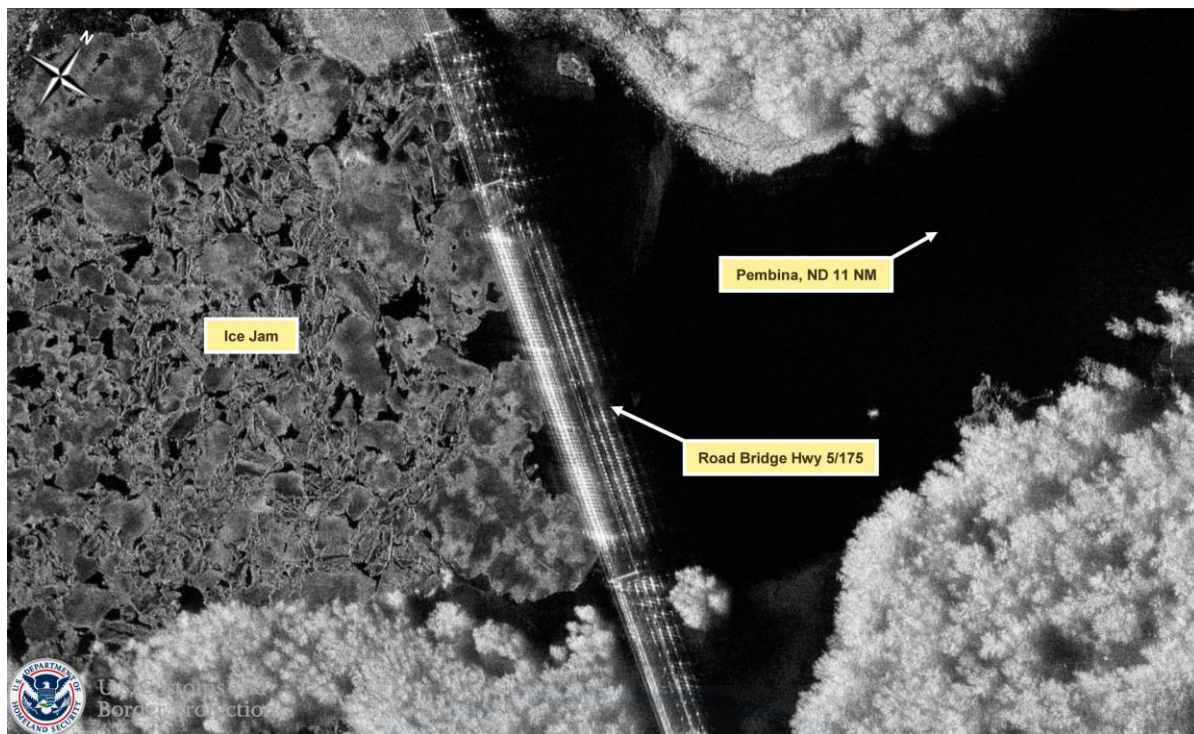


Figure 2. Infrared Image of Ice Jam Threatening Bridge in North Dakota's Red River Flood<sup>11</sup>

The capability to produce a real-time infrared (IR), electro-optical (realistic-looking daytime TV), low-light, fused IR and low-light, and synthetic aperture radar (SAR, can see through clouds) full-motion video could be a boon to search and rescue, damage assessment, cordon placement, and humanitarian efforts after a major disaster. Many opportunities have been missed, along with countless lives that could have potentially been saved by RPA platforms.

For example, one of those missed opportunities occurred after Hurricane Katrina wreaked havoc in 2005, when RPA crews prepared to mobilize in support of the major response efforts. Unfortunately, the aircraft remained crated, because the FAA would not allow unmanned aircraft to participate in the search and rescue missions. In 2010, after an earthquake destroyed Haiti, it took almost two weeks and a Presidential order to allow RQ-1s (unarmed version of the MQ-1 Predator) to support relief efforts.

Precedent should be set, guidance provided, and infrastructure ready for RPA flight in the NAS before the next major national disaster event occurs. Ultimately, long term solutions, such as air traffic control systems improvements, new platforms with built-in avoidance technologies, and incorporated training, will allow unimpeded RPA flight anywhere in the NAS. However, this research indicates support for a near-term plan agreeable to all involved parties, which the government entities can institute immediately upon activation of an emergency response network. Ideally, the FAA and FEMA will incorporate the recommended guidance into their publications and the military will include training on the recommended procedures. This research is time-critical: the study should be finalized and resultant suggestions implemented prior to the next major man-made or natural disaster in America or its territories.



## **SECTION 3: Case Studies**

### **Hurricane Katrina**

Hurricane Katrina was one of the deadliest, costliest, and most destructive storms to hit the US coast. The Category 3 hurricane made landfall in southeastern Louisiana on August 29, 2010. The gale force winds inflicted much of the initial destruction, but the rain, levee breeches, and ensuing flooding in New Orleans caused the most significant damages and deaths. DoD's Northern Command (NORTHCOM) activated Joint Task Force (JTF) Katrina one day prior to landfall, calling up thousands of National Guard troops. In the wake of Hurricane Katrina, 1 AF, the Air Force's Numbered Air Force for NORTHCOM, requested RPA support for search and rescue, however, there was not enough time for all the coordination required. Due to national airspace restrictions, the Air Combat Command (ACC) assets could not fly, according to Tom Thibodeau, a consultant for ACC's UAS management.<sup>12</sup> The detachment commander from Nellis Air Force Base in Nevada described the attempted support as overcome by the massive amount of coordination required in a relatively short period of time.

RPAs, in the form of MQ-1 Predators from Nellis AFB, Nevada, could have made various contributions, such as search and rescue, damage assessment, pathfinding for first responders, and security overwatch for civil disturbances. The base was ready to mobilize a single MQ-1 Predator, packed in shipping crates, enough crews to fly continuous sorties, and a maintenance package of supplies, communications equipment, and maintainers within 48 hours of notification. During that time, the coordination process at the lowest levels began. Planners searched charts for possible launch and recovery locations within line-of-sight (LOS) of the potentially damaged area. The chief planner sought and achieved FAA approval of flight within the immediate vicinity of the disaster area. This airspace, cordoned by a terminal flight

restriction (TFR), was prohibited for all aircraft except those specifically approved and assisting recovery efforts. Due to the expected infrastructure damage and relative inhabitability of the airfields in New Orleans, the RPA launch and recovery element (LRE) had to be located outside the TFR. The problem in the coordination phase was the RPA's takeoff, climb, and transit from a nearby airfield to the TFR. Planners even sought Civil Air Patrol support to fly as a chase plane next to the RPA from takeoff until it entered the TFR, and then escort it back to landing. This mitigation would have satisfied the FAA's "see and avoid" requirement. Unfortunately, all of these coordination attempts fell short of the means necessary for RPAs to participate, especially during a time when federal disaster response was being pushed to its limits, both internally and publicly. The impact of RPA flight denial in Hurricane Katrina response can never be fully quantified; however, the initiatives that arose in the aftermath sparked internal, informal, non-integrated disaster response plans within the MQ-1 community at Nellis AFB. These efforts helped initiate integration opportunities for RPAs to contribute support during the next major disaster to strike NORTHCOM's area of responsibility.

### **Haiti Earthquake**

The earthquake which struck the destitute island nation of Haiti on January 12, 2010, is also a significant case for analysis. The 7.0-magnitude earthquake with epicenter near Port-au-Prince, Haiti, immediately inflicted severe structural damage to Haiti's already poorly built infrastructure, causing a death toll in the thousands.

DoD RPA crews, aircraft, and a maintenance package were mobilized, again, from the MQ-1 community, which had relocated 40 miles northwest of Nellis AFB to Creech AFB in 2006. Rather than fly LOS for the entire sortie, based on ill-suited infrastructure on the island of



Haiti and terrain impeding constant contact between the controlling crew and the aircraft, the planners opted for remote split operations via satellite (shown in Figure 3). In essence, an LRE would launch the aircraft LOS, and then hand it over to a crew at Creech through satellite communications. Based on needing immediate feedback during critical phases of flight, the LRE would then takeover the flight upon returning to base, once within LOS, mitigating the satellite delay. As depicted in Figure 3, the aircrew sits in the “GCS,” ground control station, which can either be located near the disaster area or, using satellite connectivity, half a world away.

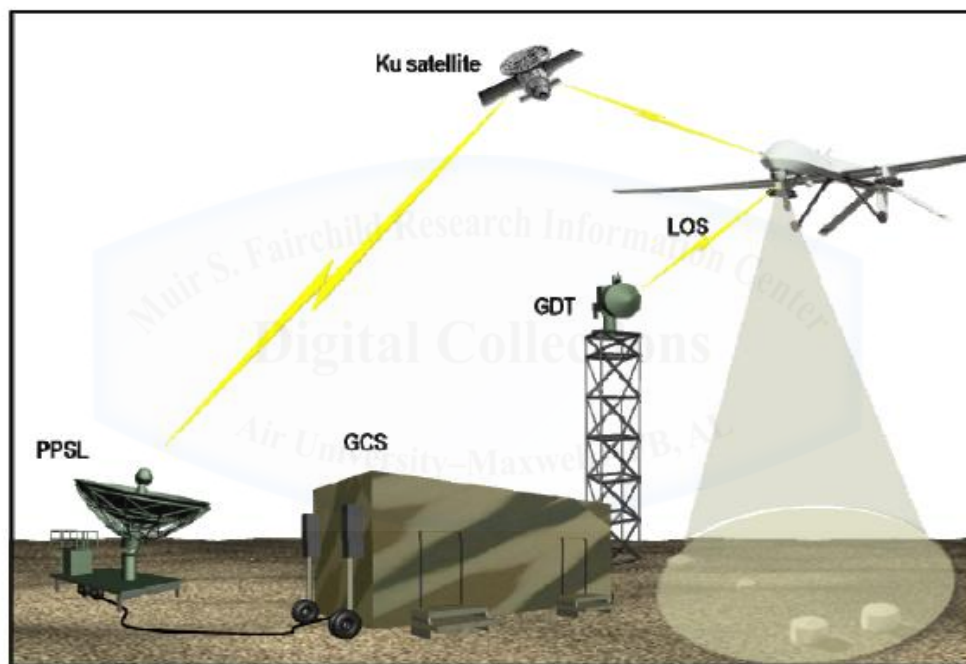


Figure 3. Line-of-Sight Versus Satellite Remote Split Operations<sup>13</sup>

Although Haiti itself is not in the NAS, the nearest suitable airfield, in Puerto Rico, is in the NAS, requiring FAA approval of takeoffs, landings, and several minutes' worth of transit to airspace over international waters. Maj Jeff Bright, the detachment commander, said “Securing approval from the FAA has been the most difficult part of the mission so far. Service officials had been in discussions with the agency for years about UAV operations at civilian airports, but it took Haitian lives hanging in the balance to move the mission along.”<sup>14</sup> While approval

authority resides with the Secretary of Defense, the President ordered the FAA to ensure coordination for the flights was accomplished.

An LRE was deployed to Puerto Rico, where the team launched the aircraft from Aeropuerto Rafael Hernandez, a civilian airport near Aguadilla, Puerto Rico.<sup>15</sup> The launch and recovery windows were specified based on avoiding the bulk of civil air traffic at Aguadilla. Because the airfield's control tower closed Class D airspace from the time the aircraft took off until it was established in the TFR corridor, the airfield was virtually closed for a 15-minute window twice a day. The aircraft had to fly in the NAS for approximately 15 minutes before reaching the TFR. Since the FAA governs airspace over Puerto Rico, the crews were constrained by the Code of Federal Regulations (CFRs) and Federal Aviation Regulations (FARs), requiring a chase plane or observer since they were not in an active restricted or warning area. Since a chase plane was not feasible, planners opted for ground-based observers, who visually monitored the aircraft while it transited to the airspace over international waters, remaining in contact with the controlling crew. Due to RPA pilot shortages, ACC complied with the FAA requirement for the observers to be rated pilots by supplying four pilots from F-16, KC-135, and C-130 Air National Guard units. Armed with binoculars, radios, and a beach chair, the spotters were evenly spaced along the transit flight path, and remained in constant radio contact with the aircrew. On one occasion, the observer spotted a civilian Cessna flying through the off-limits TFR, radioed the Predator, and informed the control tower of the violation. The RPA crew visually acquired the traffic, avoided it, and continued on its transit.

The need for RPA flight included search and rescue, damage assessment, communications relays, and security overwatch. With nearly all the communications equipment on the island destroyed, an airborne radio asset would have been helpful for radio relays between command



and control units and first responders, sequencing of humanitarian airlift flights which were overwhelming the tiny airport, and coordinated relief efforts. However, once deployed, the primary mission for the RPA became convoy support. Crews determined the extent of the infrastructure damage and viability of bridges in advance of United States Agency for International Development and United Nations Educational, Scientific, and Cultural Organization food convoys, identified rioting groups trying to stop convoys, and rerouted convoys to avoid rioters, when necessary. They also identified roadblocks set up by warlords in Port-au-Prince.

While the mission impact of the two RQ-1s' contributions to the JTF were not notably significant, they were groundbreaking for the coordination accomplished. "Today, the Air Force team proved remotely piloted aircraft can operate safely alongside civilian, military and international air traffic during a large-scale air relief campaign," commented Brig Gen Darryl Burke, Air Forces Southern Vice Commander and Air Component Coordination Element for JTF Haiti.<sup>16</sup> Although JTF Haiti is an example of effective RPA flight in the NAS and the platform's ability to perform Defense Support of Civil Authorities (DSCA), the coordination involved, lead time for approval, and operational integration into the airspace provides ample opportunity for improvement.

## **SECTION 4: Factors Affecting the Integration of RPAs**

### **FAA Restrictions to RPA Flight in the NAS**

Because RPAs do not have the capability to “see and avoid” (meaning, visually clear the flight path), the FAA mandates that they cannot fly in the same airspace as other manned aircraft. The 14 CFR Part 91, General Operating Rules, establishes a foundation for safe, predictable, and consistent operations in all classes of airspace for all types of aircraft in the NAS.<sup>17</sup> FAA Order 7610.4N specifies procedures for air traffic control planning, coordination, and services during defense activities and special military operations within the NAS.<sup>18</sup> The 2007 DoD-FAA Memorandum of Agreement allows approved DoD UAS to operate without administrative burden in specified airspace through the Certificate of Waiver or Authorization (COA) process. The FAA published Interim Operational Approval Guidance 08-01, titled “Unmanned Aircraft Systems Operations in the U.S. National Airspace System,” in March 2008, which has been the last official guidance published by FAA, primarily for internal assessment of RPA flight operations.<sup>19</sup>

The military departments have a robust process for establishing manned aircraft flight standards and procedures. However, the current ambiguity in national regulatory guidelines and standards make RPA compliance difficult to measure. While some RPAs may already be operating safely, until the necessary RPA-specific “standards, regulations, and agreed-upon compliance methodologies are defined, establishing regulatory compliance for more routine operations is difficult. In the meantime, UAS operations within the NAS are treated as exceptions through the COA process.”<sup>20</sup>

“The COA process is outlined in FAA Order 7610.4, *Special Military Operations*, section 12, that identifies the procedures to be followed along with those found in FAA Order 7210.3,

*Facility Operation and Administration, Part 6, Chapter 18.* This order describes the guidelines for receiving a grant of approval for a COA and therefore constitutes a reprieve from specific regulations within the CFR for the period specified.”<sup>21</sup> Public operators (all government assets) are required to have a COA from the FAA to fly in the NAS. The operating agency itself determines the airworthiness of the aircraft, rather than the FAA. A Notices to Airmen (NOTAM), an advisory within a dynamic database that all pilots check prior to any flight in the NAS, must be issued and in effect during the time the aircraft is using the airspace. The purpose of the COA is to mitigate those sections of 14 CFR, Part 91, which RPAs are unable to comply with if the aircraft fly outside of active restricted or warning airspace. As depicted in Figure 4, only the Restricted Areas, shaded red, are FAA-approved for unimpeded RPA flight.



Figure 4. Military Operations Area and Restricted Airspace in the US<sup>22</sup>

As of January 21, 2011, the FAA had 266 total active COAs, 151 pending, with 298 issued in CY2010.<sup>23</sup> The FAA has developed three versions of special COAs, to include the DoD/FAA Memorandum of Agreement, disaster relief, and emergency COA shells. Only one

RPA, the US Air Force's Global Hawk, has been granted continual NAS access.<sup>24</sup> DoD received a national COA, the first, and only, of its kind for Global Hawk flight in the NAS in 2003.<sup>25</sup> Since the RQ-4 Global Hawk flies at altitudes of 40,000<sup>26</sup> to 60,000 feet, it is not a safety concern for mid-air collision avoidance or other de-confliction issues for the FAA.<sup>27</sup> The FAA's advertised time to process an application to granting the COA is normally 60 business days, however some complex missions may take longer, while renewals should only take 30 business days.<sup>28</sup>

Controllers are primarily concerned with three issues related to RPA flight in the NAS, containment, lost link, and flight recovery.<sup>29</sup> Containment ensures the aircraft must be able to maintain a given, defined airspace. Lost link profiles ensure the aircraft has a predictable and safe means of returning to a recoverable point if command and control of the aircraft is lost. Flight recovery is the aircraft having an independent means of safely terminating flight in the event the link is unrecoverable.

Other FAA requirements for RPAs in the NAS are unnecessarily restrictive for DoD assets. DoD assets fly 24/7, mainly due to an IR-camera which senses infrared returns (heat), rather than the visually-acquired daylight spectrum. Also DoD RPAs fly in airspace and conditions that would not meet the requirement for VFR flight. The RPA pilot must maintain currency in a manned asset.<sup>30</sup> DoD RPA pilots do not maintain currency in manned assets, based on full-time RPA duties, limited budget for training, and unnecessary duplication of effort. Finally, each RPA must be operated by only one control station. The FAA mandates that a control station may not be used to operate multiple RPAs.<sup>31</sup> However, there is one Multi-Aircraft Control (MAC) ground control station in the Air Force inventory, allowing up to four MQ-1 aircraft to be controlled by a single pilot.

In 2006, FAA and DoD senior leaders signed a document, called the “Disaster Management Protocols,” where they agreed that “Anything less than full cooperation between DoD and FAA will translate into a less than optimum response for those who depend on us during a time of crisis.”<sup>32</sup> While DoD and FAA cooperation is arguably a crucial element of the argument, interoperability among these two agencies and FEMA is extremely important, and requires further assessment.

### **FEMA Response and Incident Management Plans**

In March 2011, President Obama declared in Presidential Policy Directive 8 (PPD-8),

The national preparedness system shall include an interagency operational plan to support each national planning framework. Each interagency operational plan shall include a more detailed concept of operations; description of critical tasks and responsibilities; detailed resource, personnel, and sourcing requirements; and specific provisions for the rapid integration of resources and personnel.<sup>33</sup>

The way current response guidance is built the NRF is the over-arching guidance, like doctrine, with specific annexes for major categories of events. The annexes attempt to describe the likely participants and describe the coordination organization structure. Federal, state, and local authorities develop their own interagency concept of operations (CONOPS) and operations plans (OPLANS). However, the current CONOPS/OPLANS, which are nested in the *NRF*, will soon undergo a major change based on PPD-8. The future of FEMA is the National Preparedness Goal, an interagency mission statement, from which emerges the National Preparedness System (NPS).

The NPS directs the creation of five national frameworks: Protection, Prevention, Response, Recovery, and Mitigation. While the *NRF* concentrates mainly on response, these five high-level guidance documents will cover the whole spectrum of NPS activities. Each of the

frameworks will then have a subordinate document called the Interagency Operations Plan. These non-incident specific documents will be more detailed, to include some tactics, techniques, and procedures (TTPs) and best practices. The National Disaster Recovery Framework was completed and released in September 2011,<sup>34</sup> but the remaining PPD-8 deliverables are still being developed.<sup>35</sup>

The National Incident Management System (NIMS) is described in a companion document to the *NRF* that provides standard command and management structures for response activities. “This system provides a consistent, nationwide template to enable Federal, State, tribal, and local governments, the private sector, and NGOs [non-governmental organizations] to work together to prepare for, prevent, respond to, recover from, and mitigate the effects of incidents regardless of cause, size, location, or complexity.”<sup>36</sup> The fledgling NIMS will only mature with the implementation of the NPS. A CONOP “...describes the concept of operations for integrating and synchronizing Federal capabilities to accomplish critical tasks, and describes how Federal capabilities will be integrated into and support regional, State, and local plans to meet the objectives described in the Strategic Plan.”<sup>37</sup> It is ideally suited for an RPA integration plan, although each affected agency will need to develop its own OPLAN.

The National Military Command Center (NMCC) will initially coordinate any military response required.<sup>38</sup> DoD maintains a Defense Coordinating Officer (DCO) for each of the 10 FEMA regions, and is the single point of contact at the joint field office (JFO) for requesting assistance from DoD.<sup>39</sup> NIMS suggests that the Operations Section Chief may establish an Air Operations Branch when the incident requires complex air operations.<sup>40</sup> Furthermore, it suggests an Air Tactical Group should be designated when helicopters and fixed-wing assets must operate



simultaneously in the incident airspace.<sup>41</sup> Figure 5 below depicts organizational structure when a JFO is established for an event.

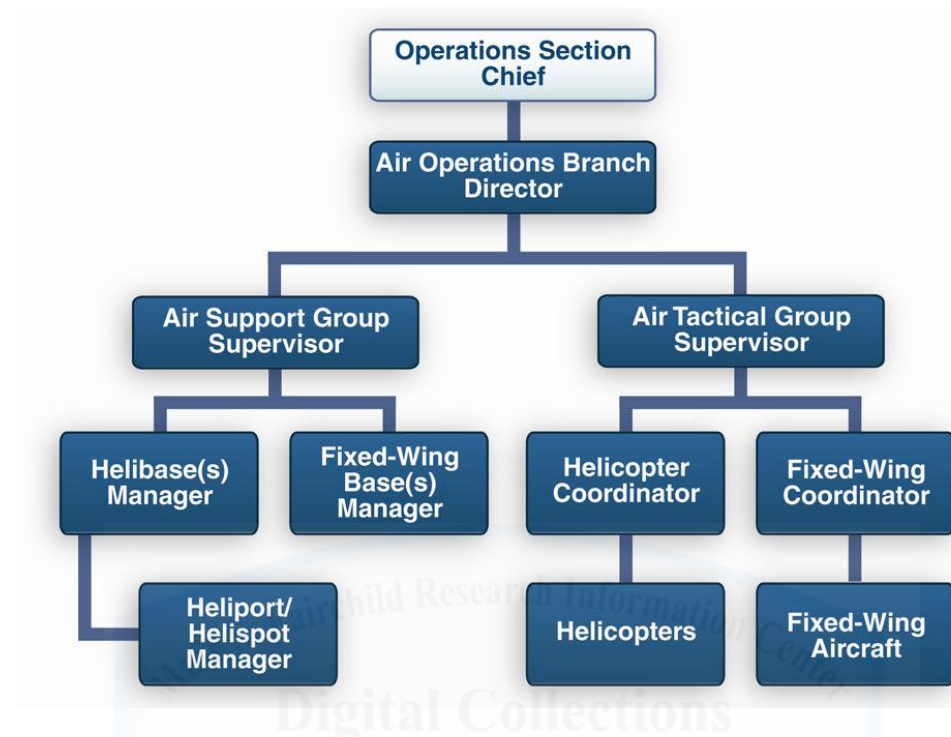


Figure 5. Organizational Chart Depicting FEMA Joint Field Office Structure<sup>42</sup>

Although RPAs are technically fixed-wing aircraft, the intent is that the Fixed-Wing Coordinator handle all manned airplanes, while an RPA Coordinator, on equal echelon with the Helicopter and Fixed-Wing Coordinators, would handle all RPA operations.

The level of interoperability of RPAs with all assets, both air and ground, will have a significant impact on effectiveness of RPA contributions to the combined efforts of responding agencies. Due to the regulatory, legal, and ethical differences from executing warfare, using DoD assets in the US homeland requires further investigation and coordination.

## **Defense Support of Civil Authorities**

Defense Support of Civil Authorities (DSCA) is the support provided by US Federal military forces, DoD civilians and contractors, component assets, and National Guard forces in response to requests for assistance from civil authorities for domestic emergencies, law enforcement support, and other domestic activities.<sup>43</sup> It can be requested by civil authorities and approved by DoD officials, or as directed by the President, within the US, District of Columbia, Commonwealth of Puerto Rico, US Virgin Islands, Guam, American Samoa, Commonwealth of Northern Mariana Islands, and any territory or possession of the US.<sup>44</sup>

The Robert T. Stafford Disaster Relief and Emergency Assistance Act directs that “federal agencies may, on the direction of the President, provide assistance essential to meeting immediate threats to life and property resulting from a major disaster.”<sup>45</sup>

During the immediate aftermath of an incident which may ultimately qualify for assistance under ... this Act, the Governor of the State in which such incident occurred may request the President to direct the Secretary of Defense to utilize the resources of the Department of Defense for the purpose of performing on public and private lands any emergency work which is made necessary by such incident and which is essential for the preservation of life and property. Such emergency work may only be carried out for a period not to exceed 10 days.<sup>46</sup>

Post-Katrina Emergency Preparedness Reform Act of 2006 amends the Stafford Act and requires a “Federal Response Capability Inventory” (not complete as of the 2008 GAO Report), which should include a list of DoD organizations and functions able to support civil authorities.<sup>47</sup>

DODD 3025.1, “Military Support to Civil Authorities,” is a directive which identifies the policy and responsibilities by which DoD responds to major disasters or emergencies per the Stafford Act and other authorities. DODD 3025.15, “Military Assistance to Civil Authorities,” states that DoD shall cooperate with and provide military assistance to civil authorities, as directed by and consistent with applicable law, Presidential directives, and Executive orders.<sup>48</sup>



It is DoD policy that DSCA plans shall be compatible with the *NRF*, NIMS, and all contingency plans, using planning that will consider command and control options that will emphasize unity of effort.<sup>49</sup> No DoD RPA will be used for DSCA, including support to Federal, State, local, and tribal government organizations, unless expressly approved by the Secretary of Defense.<sup>50</sup> Furthermore, use of armed RPAs for DSCA is not authorized.<sup>51</sup> DoD reported to Congress the importance of RPAs and highlighted the platforms' recent contributions in the 2010 report:

The airborne persistence and suite of sensors and radars that characterize UAS bring added capabilities to disaster and emergency assistance. DHS employs UAS for situational awareness, critical infrastructure assessment, and emergency response to aid planners and leadership on how best to employ resources to stem suffering and damage. Recent examples include the 2009 river flooding in North Dakota and Minnesota and the 2010 Mississippi Canyon oil spill in the Gulf of Mexico. In both instances, it was determined that the disasters were of such severity and magnitude that effective response was beyond the capabilities of the State and the affected local governments and that Federal assistance was necessary. In both incidents, DHS employed UAS to provide aerial imagery to help assess flooding/oil extent and concentration.<sup>52</sup>

However, all RPAs used in these disasters were DHS assets, not DoD assets. Specifically, DHS' Customs and Border Protection (CBP) flew its Predator B aircraft (known in DoD as the MQ-9 Reaper) in DHS' response to the Red River flooding in 2009, 2010, and 2011.<sup>53</sup> CBP has numerous COAs, most notably along the US-Mexico border for its primary homeland security mission. The agency was able to fly its RPAs in the NAS through a relatively easy COA approval, since it has existing COAs out of one of its locations at Grand Forks AFB, to support pre- and post-flood impacts. A COA was also granted to the agency to allow unimpeded flight in support of the 2010 Deepwater Horizon oil spill in the Gulf of Mexico.<sup>54</sup>

## DoD Participation in DSCA

The Assistant Secretary of Defense for Homeland Defense and America's Security Affairs (ASD (HD & ASA)) outlined for potential requestors of DoD support that "When deciding to commit DoD resources, consideration is given to military readiness, cost, lethality, risk, appropriateness, and whether the response is in accordance with applicable laws and regulations."<sup>55</sup> Civilian responders, to include local, state, tribal, and federal authorities must understand that DoD assets may not be immediately available for response, due to their primary mission, and the time required to mobilize for each particular incident. An RPA executive committee acknowledges that "DoD needs to be able to respond rapidly to operational tasking, typically from a COCOM [combatant command] such as the United States Northern Command (NORTHCOM). Many of these tasked missions relate to homeland defense, homeland security, and defense support to civilian authorities."<sup>56</sup> Additionally, the ASD (HD & ASA) proclaimed that "DoD is a full partner in the Federal response to domestic incidents and the DoD response is fully coordinated through the mechanisms outlined in the *National Response Framework (NRF)*."<sup>57</sup> However, an information brochure produced by the Office of the ASD (HD & ASA) does not fully capture the current situation with RPAs and associated lack of established interagency coordination and outdated guidance. The current established guidance for requesting assistance from DoD, and the vetting process for legitimacy of support, remain unaffected by the addition of RPAs as one of DoD's assets from which to devote to a disaster response.

NORTHCOM makes the distinction between Homeland Defense (HD) and DSCA specifically to allay the fears of those concerned for privacy. Incident Awareness and Assessment (IAA) is:

Similar to DoD's definition of Intelligence, Surveillance and Reconnaissance (ISR) missions. However, ISR is conducted outside the United States over foreign territory

or within the United States during Homeland Defense events, while IAA is conducted within the United States in support of Defense Support of Civil Authorities operations. The change in title is necessary to make it clear that DoD does not collect intelligence on US persons. Incident Awareness and Assessment is the term used to describe the types of activities conducted to give commanders and primary decision-makers at the strategic, operational and tactical-levels, key pieces of information needed to make decisions regarding a DSCA operation.<sup>58</sup>

NORTHCOM mandates that all 1 AF RPA IAA “planning and operations will be fully compliant with the *Posse Comitatus Act* and *Executive Order 12333, US Intelligence Activities*, as well as other US laws and policies regarding the use of US Armed Forces in a domestic role.”<sup>59</sup> “Access to the national airspace presents one of the biggest challenges in DoD HD and DSCA scenarios,” acknowledges the AFNORTH concept of employment.<sup>60</sup>

Currently, RPAs routinely only fly in restricted airspace, that which is not approved for general aviation or commercial flight. DoD assets operating in America include MQ-1s and MQ-9s at Holloman AFB, New Mexico, flying in restricted airspace over the DoD-owned White Sands Missile Range (WSMR). The FAA has issued COAs for these MQ-1/9s, to cross a sliver of airspace between WSMR and Ft Bliss-owned restricted airspace. These COAs (one for each type of RPA) require the RPA to cross the airspace rather than loiter within the airspace, cross at or above 18,000 feet mean sea level (MSL), and report when clear of the airspace. The COAs are renewed annually, through a process that takes several months of coordination. If a major national disaster were to occur within the airspace governed by any of the currently approved COAs, RPA flight would be fairly easy to coordinate. However, the COAs typically cover only the minimum required airspace for the mission of that specific platform, and generally only near the airfield from which they operate. This limitation is a key factor for DoD participation in DSCA events.

## SECTION 5: Current Status of Integration Efforts

In the FY2009 National Defense Authorization Act (NDAA), Congress directed the creation of an Executive Committee, comprised of DoD and the FAA.<sup>61</sup> “The sense of Congress was that progress has been lagging in the integration of UAS into the NAS for operational training, operational support to the Combatant Commanders, and support to domestic authorities in emergencies and natural disasters.”<sup>62</sup> The UAS Executive Committee (ExCom) is tasked to work on those efforts that will provide near term access for RPAs operated by federal agencies. The FY10 NDAA further directed DoD and Department of Transportation (DoT), with consult from DHS, to develop a plan for expanded access to the NAS.<sup>63</sup> National Aeronautics and Space Administration (NASA) representatives were also invited to join the ExCom. The resulting *National Airspace System Access Plan for Federal Public Unmanned Aircraft Systems*, known as the *NAS Access Plan*, establishes the milestones for expanded airspace access, policy recommendations, and resources required by all participating agencies.<sup>64</sup> The ExCom’s efforts are for the routine access to the NAS, but the solutions proposed can be partially useful in a temporary situation such as humanitarian relief.

DoD currently has 146 RPA units based at 63 continental United States locations, and by 2015, the Joint UAS Center of Excellence (JUAS COE) estimates that DoD will have 197 units at 105 locations, which is a 35% unit increase and a 67% increase in number of locations.<sup>65</sup> “The JUAS COE has published a joint UAS CONOPS, which includes concepts of operations for providing domestic support to civil authorities.”<sup>66</sup> AFNORTH discusses a disaster relief COA as a pre-approved “off-the-shelf” product, requiring minimal time to activate, however the May 2011 CONEMP does not allude to AFNORTH having a disaster relief COA submitted.<sup>67</sup>

FAA spokesman Les Dorr said in a 2011 interview that the FAA has issued COAs for Haitian relief (January/February 2010), the Gulf of Mexico oil spill (June 2010), and the Red River flooding in North Dakota (April-June 2011). It also issued emergency COAs for the Japanese earthquake/tsunami (March 2011) and the Red River flooding, as well as to numerous law enforcement agencies.<sup>68</sup> In response to Japan's major disaster, the Air Force's Global Hawk, based out of Anderson AFB in Guam, provided imagery of the Fukushima Dai-Ichi power plant, identifying boundaries of the radioactive plume, and eventually, after crew ingenuity, temperatures inside the nuclear plant. Since the US owns Guam's airspace as part of the NAS, an FAA COA was required and issued within 22 hours of the earthquake.<sup>69</sup>

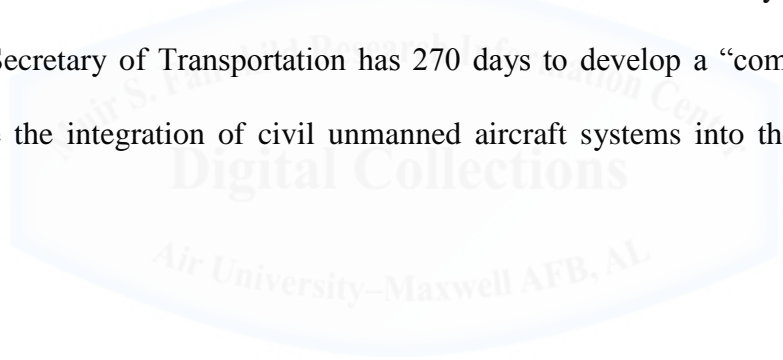
Real-time de-confliction is complicated, especially in urban, high volume air traffic areas, and when controlling numerous types of aircraft within a small area. Some suggestions include vertical separation for different types of mission sets and lateral de-confliction for aircraft that need to maintain the same altitude blocks.

A TFR is a construct already in use and recognized by all aerial participants of the NAS. A TFR is a type of NOTAM. It defines an area restricted to air travel due to a hazardous condition, a special event, or a general warning for the entire FAA airspace. The text of the actual TFR contains the fine points of the restriction. The FAA-DoD Protocols memo establishes a detailed process for coordination between the FAA and DoD, as well as outlining several scalable scenarios for aircraft de-confliction. However, it is not platform-specific, and does not cover the contingency of RPA flight within the TFRs. A major disaster, one in which RPAs would likely participate, calls for an extensive TFR sufficient to allow for altitude stratification by mission type, and possibly a Joint Operations Area (JOA) if a large amount of DoD traffic is anticipated.<sup>70</sup> One potential advantage for the FAA for RPAs to operate in an area

where FAA services are disrupted is that the platforms do not require navigational aids, functional airport lighting, or a large ground service footprint.

The 432d Wing at Creech AFB has established a draft CONOPS for DSCA operations, incorporating its lessons learned from JTF Haiti support. This type of initiative is the foundation for which integration among the affected agencies can be built. However, the largest hurdle remains the combatant command's responsibility to ensure FAA airspace is designated and approved for RPA flight.

The FAA received 23 funding extensions, experienced a two-week partial shutdown, and awaited Congressional approval of reauthorization for five years.<sup>71</sup> President Obama signed the \$63 billion FAA Modernization and Reform Act into law on February 14, 2012. Upon enactment, the Secretary of Transportation has 270 days to develop a "comprehensive plan to safely accelerate the integration of civil unmanned aircraft systems into the national airspace system."<sup>72</sup>

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## **SECTION 6: Closing**

### **Recommendations**

As FEMA regulations are being updated and some are being created, the working groups assigned to research and publish the deliverables should include inputs, requirements, and capabilities from DoD and FAA. These inputs should be focused on unimpeded, but temporary, RPA integration into the NAS while being flexible enough for continual improvements in both RPA technology and incremental increases in NAS access. Furthermore, the published guidance, in the form of the five national frameworks in the NPS, should include guidance on operational coordination and interoperability of responding agencies. Finally, to curb the concerns of those with privacy encroachment issues, this guidance should clearly outline the legal responsibilities of DSCA participants. Due to the nature of the NPS, the publication of this material will have far-reaching audiences at all levels of government, earning a more widespread acceptance from local, tribal, state, and federal entities than any published CFR or Congressional act. FEMA should include an “off-the-shelf” plan for RPA integration into disaster response final products and its online resource center. This plan should be adaptable to any disaster, both man-made and natural, with pre-coordination already accomplished, to include command and control, potential mission sets, and processing, exploitation, and dissemination of the full-motion video feeds.

Now that the FAA has renewed funding and guidance with the FAA Modernization and Reform Act of 2012, it should rapidly seek internal processes to safely de-conflict RPAs in a temporary cordoned area for a major national disaster. Although the RPA-specific requirements in this new law are aimed at long-term, permanent solutions to RPA integration into the NAS, the means to capitalize on incremental increases in airspace access should be included. While



the current COA process is sufficient for longer term flight activity, it is not sufficient for the immediate response required in a disaster situation. The FAA should incorporate RPA deconfliction measures into its initial survey of a disaster area when building TFRs, and ensure that RPAs are considered during the process.

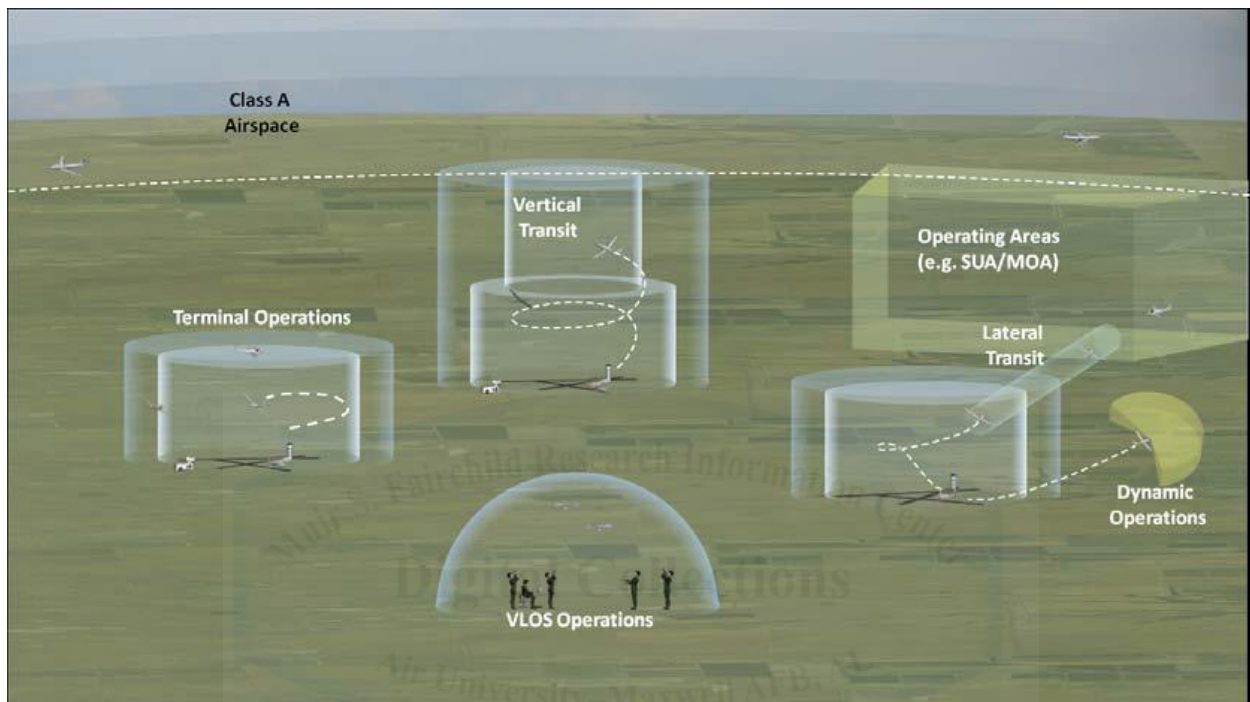


Figure 6. Operational View of Profiles for RPA Access to the NAS<sup>73</sup>

As depicted in Figure 6, the vertical transit profile was the concern for RPA flight in support of Hurricane Katrina response. While the RPA would have been approved into the TFR surrounding New Orleans if it had departed and landed inside the TFR airspace, none of the airfields underlying that airspace were useable. Also from Figure 6, the lateral transit profile, similar to the construct used in the Haiti earthquake response, is sufficient if properly established. The FAA should take into account the location of the RPA LRE in relation to the TFR built around the disaster area. The most ideal of all profiles, shown in Figure 6 as the dynamic operations profile, is more the long-term solution to the “sense and avoid” dilemma facing both the FAA and DoD.



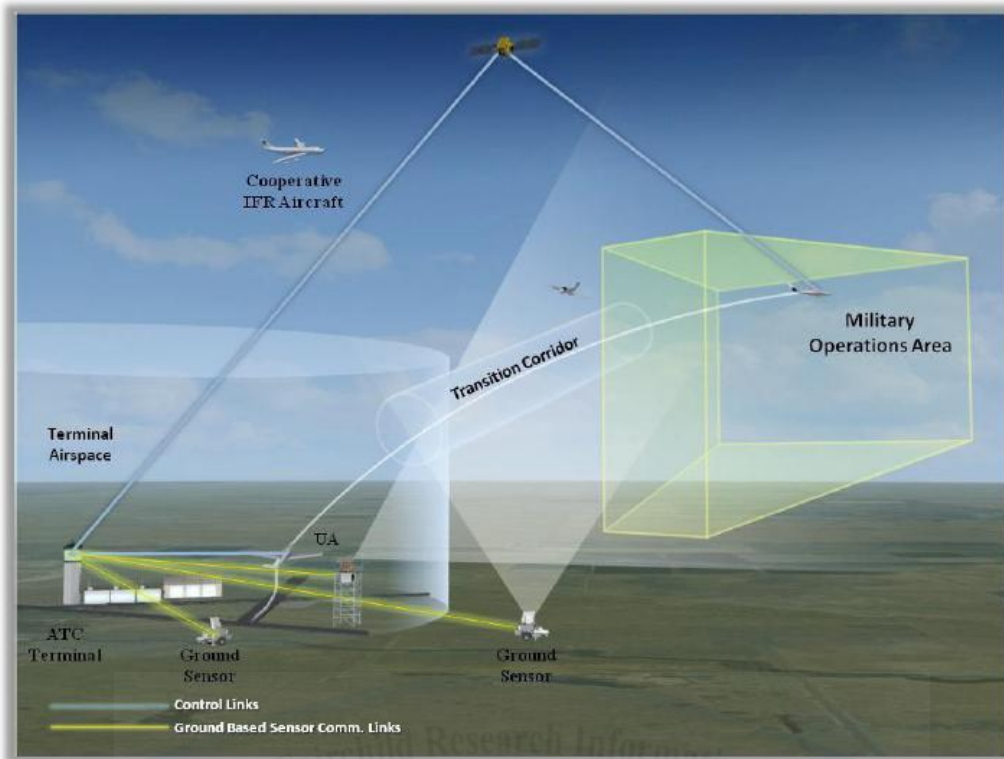


Figure 7. Example of Lateral Transit Profile<sup>74</sup>

This lateral transit airspace, basically a corridor, should be included in the TFR, and treated with the same respect and caution afforded to such high-profile TFRs as the permanent restriction over Washington, DC, and the TFRs placed over air shows, erupting volcanoes, and Presidential venues. Any publication of the NOTAM and depictions of the disaster area TFR must include the LRE location, RPA lateral transit corridor, and the airspace centered over the affected region. Since the lateral transit profile seems to be the most likely existing option for air traffic controllers and aircrews, it should receive the focus of the FAA's short- and mid-term efforts. If properly established, by avoiding the primary civil traffic routes, published through NOTAMs, and emphasized in the local media, the TFR could be very effective in de-conflicting RPAs and manned assets while providing the most efficient air response.

Currently, DSCA can only be approved by the Secretary of Defense (SecDef). This approval authority could be further delegated to lower levels, such as the Major Command or Numbered Air Force level, or to the Combatant Commanders. This delegation of authority may enhance responses to small disaster events, such as localized emergencies requiring search and rescue assets, especially if they do not detract from the DoD's mission. One example would be a forest fire in the Lincoln National Forest near Holloman AFB in New Mexico. Since Predator and Reaper missions fly training missions nearby daily, the impact to the regular ACC mission would be minimal, yet the benefits can be significant. This example demonstrates the unnecessary complexities associated with requiring SecDef approval. SecDef approval authority should be retained for such large-scale events that would require reapportioning assets from Central Command. For example, a widespread chemical, biological, radiological, or nuclear (CBRN) event on the densely populated northeast coast of the US might require DoD to temporarily realign its global commitments. DoD should seek an updated DoD-FAA MOA. The original, written in 2007, can capitalize on incremental improvements towards RPA access to the NAS.

The RPA community is currently fully tasked, maximizing FTU throughput to have a just-in-time aircrew production rate for ongoing and newly initiated combat air patrols (CAP). However, as evidenced by RPA support of JTF Haiti, the DoD's primary missions (FTU throughput and CAPs for combatant commanders) can still be accomplished while DSCA operations are in effect. A short-term surge, such as was the Haiti effort, can be absorbed by DoD, however, long-term or significant asset sourcing will need to be vetted by the SecDef.

DoD should develop a training plan that incorporates potential mission sets and NAS coordination procedures for its RPA crews. The CFRs governing DSCA, as amended in January

2011, mandate that “the Chairman of the Joint Chiefs of Staff is responsible to incorporate DSCA into joint training and exercise programs in consultation with all appropriate Federal agencies.”<sup>75</sup> A preview of a possible new training plan (see Appendix), notionally called “Domestic Disaster Relief,” reveals that it should include academic, simulator and/or flight training before a DSCA certification is given to a particular aircrew member. Academics should include governing directives, such as the applicable CFRs, FEMA’s NPS, and the FAA’s FARs, differences training between the crews’ primary mission of ISR and the DSCA mission of IAA, and TTPs of the most likely missions, such as search and rescue, damage assessment, and first-responder overwatch. The scenario-based simulator and/or aircraft flights would serve as the operational application of the doctrine, regulations, and discussions in academic training. Simulator training is recommended over flight training based on the capabilities of simulators to recreate the types of missions possible in a disaster response sortie. The suggested Domestic Disaster Relief training plan is flexible and general enough to be incorporated into any RPA platform’s formal training or combat mission readiness training. It can be tailored to any unit’s specific needs and can be accomplished in less than one additional training day.

Finally, one by-product of DoD participation in DSCA operations is the potentially favorable portrayal of RPA technology in the news media. In any DSCA participation, DoD should capitalize on the opportunity for positive publicity regarding the merit of its RPA mission in support of domestic disaster response.

### **Conclusion**

Just in the last few years there has been a significant increase in efforts to allow RPA flight into the NAS. While the evidence mounts, it is clear that the efforts are individualized by agency. The critical window of opportunity presented by several factors, such as the enactment

of the FAA Modernization and Reform Act of 2012, FEMA's doctrine overhaul in response to PPD-8, and DoD's increasing need for access to the NAS, combine to form a potential synergy of efforts. Integration is the missing piece in an existing structure that will allow for RPA flight in the NAS in support of disaster relief. Incorporating the recommendations into each agency's efforts will produce that integration, hopefully in time before the next major disaster strikes the US and its territories.



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## APPENDIX

### Domestic Disaster Relief A DoD RPA Training Plan

Training Events	Time Allotted
<u>Academics</u>	4 hours
Introduction to DSCA	.5 hour
<ul style="list-style-type: none"> <li>- Historical Examples</li> <li>- Need for DoD Support</li> </ul>	
Principles of DSCA	1.0 hour
<ul style="list-style-type: none"> <li>- Chain of Command</li> <li>- Governing Laws</li> <li>- Differences in ISR and IAA</li> </ul>	
NAS Review	1.0 hour
<ul style="list-style-type: none"> <li>- National Airspace System Refresher</li> <li>- Communication</li> <li>- TFR Primer</li> </ul>	
DSCA Operations	1.5 hours
<ul style="list-style-type: none"> <li>- Mission Sets                             <ul style="list-style-type: none"> <li>- Search and Rescue</li> <li>- Damage Assessment</li> <li>- Cordon Procedures</li> <li>- CBRN Operations</li> </ul> </li> <li>- Building Awareness of Civil Authorities</li> </ul>	
<u>Simulator Training</u>	2-4 hours
<ul style="list-style-type: none"> <li>- Scenario-based profile including:                             <ul style="list-style-type: none"> <li>- On-Scene Commander (Airborne) for rescue effort</li> <li>- Infrastructure Assessment</li> <li>- Convoy Overwatch</li> <li>- Urban and Rural area events</li> <li>- CBRN event</li> <li>- Natural Disasters (flood, fire, earthquake, tsunami, tornado, volcano eruption, etc.)</li> </ul> </li> </ul>	

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